Biodiesel Fuel

Liquid produced from such renewable sources as vegetable oil, animal fats, and used oil and fats. Biodiesel in its pure form [called neat biodiesel] has been designated as an alternative fuel for Energy Policy Act programs

Domestic Content of Fuel: 100%

Fueling: Fueling is the same as with diesel fuel.

Fuel Availability: Available only through bulk suppliers. Contact National Biodiesel Board for a list of registered suppliers.

Vehicle Experience: In the United States, over 30 million miles have been driven on neat biodiesel and biodiesel blends.

Operational Performance: Horsepower, torque, and fuel economy are similar to those for diesel fuel. Cetane number is significantly higher than that of conventional diesel fuel. Meets clean diesel standards established by CARB.

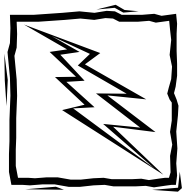
Maintenance and Reliability: Lubricity is improved over that of conventional diesel fuel. Biodiesel-compatible elastomers (hoses, gaskets, etc.) are required for use with neat biodiesel and high-percentage biodiesel blends.

Safety: Adequate training is required to operate and maintain vehicles. Flashpoint is significantly higher than that of conventional diesel fuel. Neat biodiesel is nontoxic and biodegradable.

Costs: Use of biodiesel requires little or no engine modification. Biodiesel (B20) costs an average of $1.65 per gallon depending on feedstock and supplier. Diesel costs an average of $1.51 per gallon.

Source: *Alternative Fuels Data Center 2000*

ADDITIONAL INFORMATION
FACTS ON ALTERNATIVE FUELS



Electricity

On board rechargeable batteries power an electric motor.

Domestic Content of Fuel: Over 95%, based on current mix of input energy (coal, natural gas, nuclear, hydropower, renewables) for electric-power generation.

Fueling: A cord and plug (conductive) or cord and paddle (inductive) system connects to a 120-volt, 240-volt, or higher-voltage electrical source. The connecting device may be located aboard the vehicle or in a fixed, off-vehicle location. Time needed for charging depends on voltage of the electrical source; temperature; and size, type, and remaining state-of-charge of the batteries.

Fuel Availability: Most homes, government facilities, fleet garages, and businesses have adequate electrical capacity for charging. Special hookups or upgrades may be required. Public charging facilities are being developed in many areas, especially in Southern California and Arizona.

Vehicle Experience: Over 4,000 electric vehicles are operating throughout the United States (with the largest number in California and the western United States). Many are conversions of gasoline-powered vehicles. The major auto manufacturers are producing EV's in a range of styles and sizes. EVs are also available as bicycles, scooters, and buses.

Operational Performance: Range for electric vehicles spans from 50 to 130 miles. Variables include the vehicle's weight, engineering and design features, and type of battery. Weather extremes and use of accessories (such as heating and air conditioning) can affect the range. Electric drivetrains are more energy-efficient than internal-combustion engines. Well-designed EVs can travel at the same speeds as conventional vehicles, and provide the same safety and performance capabilities.

Maintenance and reliability: Different types of batteries (such as lead-acid, nickel-metal hydride, and lithium-ion) are available depending on the manufacturer and the vehicle. Service requirements are expected to be somewhat less. No tune-ups, oil changes, timing belts, water pumps, radiators, fuel injectors, or tailpipes are required.

Safety: Auto suppliers will assist fleets with technical training. Some community colleges offer training for EV mechanics. EVs produced by the manufacturers must meet all the same vehicle safety standards as conventional vehicles.

Costs: Battery pack replacement costs will depend on the type of batteries and whether the vehicle is purchased or leased. Battery replacement is included in the price of leased vehicles. Initial commercial production vehicles are priced in the $15,000 to $40,000 range. Tax incentives could significantly lower costs. Many manufacturers are only offering EVs on a lease basis, with lease prices at $349/month or more. Electricity costs less per mile than gasoline; local utility rates may vary. Installation of equipment at charging locations may involve additional expense.

Source: Alternative Fuels Data Center 2000

ADDITIONAL INFORMATION
FACTS ON ALTERNATIVE FUELS

Ethanol

Liquid alcohol produced from grain or agricultural waste. E85 [a blend of 85% denatured ethanol and 15% gasoline] is for light-duty applications, while E95 [a blend of 95% denatured ethanol and 5% gasoline] is for heavy-duty applications

Domestic Content of Fuel: 100%

Fueling: Fueling is the same as with gasoline or diesel fuel.

Fuel Availability: Fueling stations are located primarily in the Midwest; more than 50 public E85 stations are available in 12 states. E95 is available only through bulk suppliers.

Vehicle Experience: Some auto manufacturers make all production models of selected vehicles ethanol-compatible. There are approximately 250,000 **light duty** E-85 vehicles on the road.

Operational Performance: If compression ratio is optimized for higher octane rating, ethanol has approximately 80% or more of the energy density of gasoline. May require more frequent fueling; however, some auto manufacturers are installing larger fuel tanks in the E85 vehicles, so the range is the same as the gasoline-only version. Power, acceleration, **payload**, and cruise speed provided are comparable with those for equivalent conventional fuels.

Maintenance and Reliability: Use of special lubricants may be required. Check the owner's manual or consult with the manufacturer to ensure that the correct oil is being used. Use 85 replacement parts (that is, identify E85 as the fuel when ordering). Maintenance assistance is available from local dealers; practices are very similar, if not identical, to those for conventional fueling operations.

Safety: Adequate training is required to operate and maintain vehicles.

Costs: E85 is sold in the Midwest at prices equivalent to those for mid-grade unleaded gasoline. With mass production of some E85 compatible vehicles, **OEMs** can offer these vehicles at the same prices as comparable gasoline vehicles. In heavy vehicle applications, E95 has a difficult time competing with low diesel prices.

Source: Alternative Fuels Data Center 2000

Methanol

Odorless clear liquid, produced from natural gas, coal, or biomass. M85 (85 percent methanol, 15 percent gasoline) is for light-duty applications. M100 (pure methanol) is for heavy-duty applications now; light-duty applications are under development.

Domestic content of fuel: 90-100%, depending on world market price.

Fueling: Fueling is the same as with conventional gasoline or diesel fuel.

Fuel Availability: Fueling stations are widely available in California; they are also available in New York City, Atlanta, Denver, Houston, Detroit, and other locations. M100 is available through bulk suppliers in most major cities. M100 is a leading candidate to provide hydrogen to power developing fuel cell vehicles.

Vehicle Experience: More than 20,000 M85 f**lexible-fuel** vehicles are in operation. Nearly all use of methanol is in **light-duty** vehicles.

Operational Performance: Because of methanol's lower energy content, mileage will be slightly lower than for comparable gasoline-powered vehicles. Power, acceleration, and **payload** are comparable with those for equivalent internal-combustion engines.

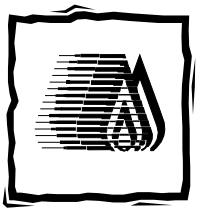
Maintenance and Reliability: Use special lubricants available by direct order from supplier (significant cost premium over conventional motor oils). Use M85-compatible replacement parts (that is, identify M85 as fuel when ordering).

Safety: Adequate training is required to operate and maintain vehicles.

Costs: M85 fuel cost is equal to, or slightly above, that for premium-blend gasolines. In California, the major methanol supplier adjusts the price of methanol to the average cost for regular unleaded gasoline (after accounting for the difference in energy content). M85 flexible-fuel vehicles are being offered at prices slightly higher than those of comparable gasoline--powered vehicles.

Source: Alternative Fuels Data Center 2000

ADDITIONAL INFORMATION
FACTS ON ALTERNATIVE FUELS



Natural Gas

Extracted from underground reserves; composed primarily of methane. For compressed natural gas [CNG], gas is compressed to 2,400-3,600 pounds per square inch in specially designed and constructed cylinders. For liquefied natural gas [LNG], gas is cooled to minus 259ºF and stored in insulated tanks.

Domestic content of fuel: 100%

Fueling: Slow fill (up to 8 hours) and "**quick**" **fill** (3 to 5 minutes) are available for CNG. LNG fueling times are comparable with those for gasoline or diesel fuels.

Fuel availability: Fueling stations for CNG are located in most major cities and in some rural areas. LNG is only available through suppliers of **cryogenic** liquids.

Vehicle Experience: Over 75,000 in U.S. and nearly 1 million worldwide. Auto manufacturers offer many different types and styles of CNG vehicles. Heavy vehicle manufacturers can install one of several available CNG or LNG engines in products they offer. One out of every five new transit buses in the United States is powered by natural gas.

Operational Performance: For CNG and LNG vehicles the range depends on fuel storage capacity, but generally it is less than that of comparable gasoline-fueled vehicles. Power, acceleration and cruise speed are comparable with those of an equivalent conventionally fueled engine. Cylinder location and number may displace some **payload** capacity.

Maintenance and reliability: High-pressure tanks require periodic inspection and certification. Some fleets report two to three years longer service life and extended time between required maintenance. However, manufacturers and converters recommend conventional maintenance intervals.

Safety: Pressurized tanks have been designed to withstand severe impact, high external temperatures, and automotive environmental exposure; they are as safe as gasoline tanks. Design changes have resolved problems responsible for earlier in-service failures. Adequate training is required to operate and maintain vehicles; training and certification of service technicians is required.

Costs: Fuel cost is less than that of gasoline, per gasoline gallon equivalent: local utility rates vary. The auto manufacturer's price premium can be $1,500 to $6,000. Incremental cost premiums for CNG **heavy-duty** trucks and transit buses is in the range of $30,000 to $50,000. Federal and other incentives can help defray some of the increase in vehicle acquisition costs. Fleets may need to purchase service and diagnostic equipment if access to commercial CNG/LNG vehicle maintenance facilities is not available

Source: Alternative Fuels Data Center 2000

Propane

Liquefied petroleum gas, or LPG [commonly called propane], is a liquid mixture [at least 90% propane, 2.5% butane and higher hydrocarbons, and the balance ethane and propylene]. It is a by-product of natural gas processing or petroleum refining.

Domestic content of fuel: Between 95 percent and 98 percent.

Fueling: Similar to filling a gas grill tank; time is comparable with that needed for gasoline or diesel fuel. Tank should be filled to no more than 80% capacity, to allow for liquid expansion as ambient temperature rises.

Fuel availability: Propane is the most accessible of the liquid and gaseous alternative fuels. Publicly accessible fueling stations exist in all states; more than 10,000 are documented.

Vehicle use: More than 350,000 on- and off-road propane-powered units in the United States, and about 3.5 million worldwide.

Operational Performance: Range on LPG may be more or less than that of comparable gasoline-powered vehicles depending on the size of the tanks. Range for bifuel LPG/gasoline vehicles is greater than that of gasoline vehicles. Power, acceleration, **payload**, and cruise speed are comparable with those obtained with an equivalent internal-combustion engine.

Maintenance and reliability: Some fleets report two to three years longer service life and extended time intervals between required maintenance. However, manufacturers recommend conventional maintenance intervals. Propane combusts in the gaseous phase, resulting in less corrosion and engine wear.

Safety: Adequate training is required to operate and maintain vehicles.

Costs: Propane cost in fleets typically range from 5% to 30% less than those of gasoline. Fueling station cost is similar to, or lower than, that for a comparably sized gasoline dispensing system. Service and diagnostic equipment would probably be required if access to commercial propane vehicle maintenance facilities is not available. Factory-installed light-duty truck conversion costs about $2,500 over the conventional vehicle base price.

Source: *Alternative Fuels Data Center 2000*